

**U.S. FISH AND WILDLIFE SERVICE  
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Eua zebrina*

COMMON NAME: Tutuila tree snail; sisi vao

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: September 2005

**STATUS/ACTION:**

\_\_\_\_\_ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

\_\_\_\_\_ New candidate

X Continuing candidate

\_\_\_\_\_ Non-petitioned

X Petitioned - Date petition received: May 11, 2004

\_\_\_\_\_ 90-day positive - FR date:

X 12-month warranted but precluded - FR date: May 11, 2005

N Did the petition request a reclassification of a listed species?

**FOR PETITIONED CANDIDATE SPECIES:**

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov>)

\_\_\_\_\_ Listing priority change

Former LP: \_\_\_\_\_

New LP: \_\_\_\_\_

Date when the species first became a Candidate (as currently defined): November 15, 1994

- \_\_\_\_ Candidate removal: Former LP: \_\_\_\_
- \_\_\_\_ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
- \_\_\_\_ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- \_\_\_\_ F – Range is no longer a U.S. territory.
- \_\_\_\_ I – Insufficient information exists on biological vulnerability and threats to support listing.
- \_\_\_\_ M – Taxon mistakenly included in past notice of review.
- \_\_\_\_ N – Taxon does not meet the Act’s definition of “species.”
- \_\_\_\_ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Snails; Family Partulidae (Snail)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: American Samoa, islands of Tutuila and Ofu

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:  
American Samoa, islands of Tutuila and Ofu

#### LAND OWNERSHIP

Land ownership in American Samoa generally follows a historic village tradition. Large sections of land around each village are controlled by the village for the use of the village residents. All known populations of the Tutuila tree snails are on village lands.

LEAD REGION CONTACT: Paul Phifer (503) 872-2823, paul\_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Lorena Wada (808) 792-9400, lorena\_wada@fws.gov

#### BIOLOGICAL INFORMATION:

Species Description: The biology of Samoan partulid tree snails has not been extensively studied. However, there is considerable information (reviewed by Cowie 1992) on the partulid tree snails of the Mariana Islands (Crampton 1925a; Hopper and Smith 1992) and the Society Islands (Crampton 1925b, 1932; Murray *et al.* 1982; Johnson *et al.* 1986a, b). This ancient family of snails is considered to be ovoviviparous, although viviparity may be a more accurate description, as considerable growth occurs *in utero*. Some species in the family are known to be self-fertile while other partulids, including *Samoana conica* of Tutuila, rely predominantly on out crossing (Johnson *et al.* 1986a). In the genus *Partula*, shell length at birth is 3-3.5 millimeters (mm) (0.12-0.14 inches (in)) and sexual maturity is attained in less than 1 year at a shell length of 11-30 mm (0.43-1.18 in), depending on the species. Adults live about 5 years and give birth about every 20 days, producing about 18 offspring per year (Cowie 1992). Cooke (1928) reported *Eua zebrina* feeding on non-partulid snails during periodic visits to the forest floor.

Taxonomy: The Tutuila tree snail is a member of the family Partulidae, which is widely distributed throughout the high islands of Polynesia, Melanesia and Micronesia in the south- and west-Pacific basin (Cowie 1992). Many of the 123 partulid species (Kondo 1968) are restricted to single islands or isolated groups of islands. The Samoan partulid tree snails are a good example of this endemism. The two large islands of Western Samoa (Savai'i and 'Upolu) are home to five partulid tree snails. Only one of these, *Samoana conica*, is also found in American Samoa on the island of Tutuila. Two additional partulid species are endemic to single islands in American Samoa; *Samoana abbreviata* on the island of Tutuila, and *S. thurstoni* on the island of Ofu. The Tutuila tree snail can be found on the islands of Tutuila and Ofu. Kondo's 1968 taxonomic write up is the most recent and accepted taxonomy for this species.

Habitat: Cooke (1928) suggested that habitat partitioning may occur among the three partulids of Tutuila. *Samoana conica* and *S. abbreviata* were commonly found on trunks and branches, and the Tutuila tree snail was commonly found on leaves. A similar partitioning of habitat has been reported for the *Partula* of the Society Islands (Murray *et al.* 1982).

Historic and Current Range/Distribution: In a 1993 survey, 34 individuals of the Tutuila tree snails were seen alive; 11 at Sauma Ridge (122-168 meters (m) (400-551 feet (ft)) elevation) and 23 on Nu'usetoga Island (73 m (239 ft)) elevation; about 100 m (328 ft) offshore of Tutuila (Miller 1993). In a 1998 survey, the Tutuila tree snail was seen alive at 30 of 87 survey sites on the main island of Tutuila and at 1 of 58 sites in the Manua Islands (Cowie and Cook 1999; Cowie 2001). The snails were typically found scattered on understory vegetation in a forest with an intact canopy 10-20 m (33-66 ft) above the ground.

Cowie (2001) compared the long term changes based on observations from his 1998 survey and earlier work done in 1993 (Miller 1993) and 1975 (Solem 1975; Christensen 1980). Of 12 endemic species recorded alive in 1975, living individuals of five species and the shells of two additional species were seen in 1993. In 1998 11 were seen alive and shells from one additional species were found. Cowie (2001) characterized 3 of these 12 species as being stable in numbers and the rest were described as declining in numbers, including all four of the *Partula* species found in American Samoa. These survey data indicate that the native snail fauna is declining and that the partulid tree snails and several other terrestrial and arboreal species are of particular concern Cowie (2001).

In recent surveys of Tau and Ofu (Cowie and Cook 1999, 2001) the Tutuila tree snail was discovered on the island of Ofu. Eighty-eight individuals were recorded at the single locality. Ofu does not yet have *Euglandina rosea* (see section on Disease and Predation below). Hence the Ofu population of the Tutuila tree snail is of major conservation significance.

## THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Loss of habitat to agriculture and to storms has greatly reduced the native habitat of Samoan snails. All live Tutuila tree snails were found on understory vegetation beneath remaining intact forest canopy. No snails were found in areas bordering agricultural plots or in forest

areas that were severely damaged by hurricanes. Under natural historic conditions, loss of forest canopy to storms did not pose a great threat to the long term survival of these snails. Enough intact forest with healthy populations of snails would support dispersal back into newly regrown canopy forest. However, the presence of introduced alien weeds such as mile-a minute vine (*Mikania micrantha*) and weedy tree species such as *Funtumia elastica* may reduce the likelihood that native forest will become re-established in areas damaged by hurricanes (Whistler 1992). Native habitats provide the structure, microclimate, and food source that the Tutuila tree snail requires. It is not known whether any of these alien species provide suitable habitat for the Tutuila tree snail. This loss of habitat to storms is exacerbated by increased agriculture that is needed to support one a growing population (Craig *et al.* 1993). Agricultural plots have spread from low elevation up to middle and some high elevations on all the islands, significantly reducing the forest area and thus reducing the resilience of the forest and its populations of native snails. Loss of forest also increases the likelihood that future storms will lead to the extinction of populations or species that rely on the remaining canopy forest.

No conservation measures have been undertaken to address these threats for this species.

**B. Over-utilization for commercial, recreational, scientific, or educational purposes.**

In the past, snails were used in ornamental products. This is no longer a major threat since populations of Tutuila tree snails are now difficult to locate. However, at the present time, collecting a few adult snails can remove a large percentage of the reproductive population in a bush or tree, thereby driving that population closer to extinction.

**C. Disease or predation.**

The alien giant African snail, *Achatina fulica*, was introduced into American Samoa prior to 1977. This snail is a crop pest and an intermediate host of the rat lung worm, *Angiostrongylus cantonensis*, which can cause human eosinophilic meningoencephalitis (Alicata 1962; Mead 1979). The most commonly recommended biological control agent of the giant African snail is the predatory snail *Euglandina rosea*. However, *E. rosea* is also a host to the rat lung worm, a parasite, and occupies a wider range of habitats than does the giant African snail (Mead 1961; van der Schalie 1969), potentially spreading the rat lung worm through a wider area. It is not known if the parasite can be maintained in populations of native snails or if a parasite load would have negative effects on endemic snail reproduction.

In an effort to eradicate the giant African snail, alien predatory snails, *Euglandina rosea* and *Gonaxis kibweziensis*, were introduced in 1980 and 1977, respectively. *A. fulica* and *E. rosea* have spread throughout the main island of Tutuila and have also spread to the island of Ta'u. By 1984, *E. rosea* was considered to be well established on Tutuila (Eldredge 1988). *G. kibweziensis* is present only on Tutuila and seems to be in decline.

After an initial increase lasting up to several years, the populations of giant African snails typically go into decline (Mead 1961). Available data does not definitively show that reductions in population size are due to predation by carnivorous snails (Mead 1961; Hadfield and Kay 1981; Christensen 1984; Eldredge 1988). In fact, *Euglandina rosea* is

probably not of great importance as a predator of giant African snails (Mead 1961), as it prefers to feed on small snails (Cook 1989; Griffiths *et al.* 1993), which include most of the native snails on the Pacific islands to which it has been introduced. The lack of evidence for predatory control of the giant African snail has not stopped the intentional spread of snail predators like *E. rosea* into and throughout the Pacific basin, although numerous studies show that *E. rosea* feeds on endemic island snails and is a major agent in their declines and extinctions (van der Schalie 1969; Colman 1977; Hart 1978; Hadfield and Mountain 1981; Howarth 1983, 1985, and 1991; Clarke *et al.* 1984; Pointier and Blanc 1984; Hadfield 1986; Murray *et al.* 1988; Hadfield *et al.* 1989, 1993; Kinzie 1992). At present, the major threat to long-term survival of the native snail fauna in American Samoa is predation by *E. rosea*.

At Sauma Ridge, the alien predatory snail *Euglandina rosea*, was found alive within meters of some of these snails. Shells of the Tutuila tree snails and another Samoan partulid (*Samoana conica*) were found on the ground at several of the locations surveyed on Tutuila, along with numerous shells and an occasional live individual of *E. rosea*.

The population of Tutuila tree snails on Nu'usetoga Island was probably isolated from an ancestral parent population of the main island of Tutuila in prehistoric time. No live *Euglandina rosea* or *Gonaxis kibweziensis* were found on this offshore islet. Thus, the Tutuila tree snails on this island are, for the moment, safe from predatory snails.

Recent surveys recorded partulid tree snail shells that were damaged in a fashion that is typical of rat predation; the shell is missing a large piece of the body whorl or the apex. Old shells may be weathered in a similar fashion, except that the fracture lines are not sharp and angular. Signs of rat predation were seen at the sites with the largest remaining populations of partulid tree snails (Sauma Ridge and Nu'usetoga Island) (Miller 1993). Studies in Hawaii (Hadfield *et al.* 1993) have shown that both rats and *Euglandina rosea* can quickly devastate tree snail populations. Live trapping in Hawaii has implicated the Polynesian rat (*Rattus exulans*), although *R. rattus* and *R. norvegicus* may also be significant threats to native snail populations. All three rat species have been introduced throughout the Pacific islands.

No conservation efforts are being undertaken to address these threats for this species.

#### D. The inadequacy of existing regulatory mechanisms.

Currently, no formal or informal protection is given to the Tutuila tree snail by the Federal government or by the government of American Samoa or any private individuals or groups.

#### E. Other natural or manmade factors affecting its continued existence.

Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and individuals and the small geographic range of the known populations. This circumstance makes the species more vulnerable to extinction due to a variety of natural processes such as typhoons and drought. Small populations are particularly vulnerable to reduced reproductive vigor caused by inbreeding depression, and they may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to cope with environmental change (Lande 1988; Center for Conservation Update 1994). This

is especially true due to several life-history features of this and all other *Partulid* tree snails (Cowie 1992). Adults require eleven months to reach sexual maturity, reproductive rates are lower because eggs are not laid as in most terrestrial snails, but the young are born live, meaning fewer snails are added to the population, and dispersal is very limited with most individuals remaining in the tree or bush into which they were born. These traits make these snails very sensitive to any random event that could lead to a reduction or loss of reproductive individuals.

#### CONSERVATION MEASURES PLANNED OR IMPLEMENTED

There are no conservation activities to report.

#### SUMMARY OF THREATS

The declines of these native snails have resulted from loss of habitat and predation by introduced snails and rats. These threats may interact to greatly exacerbate the loss of populations and species. There are no efforts being undertaken to address these threats for this species.

#### LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
<b>High</b>	<b>Imminent</b>	Monotypic genus	1
		<b>Species</b>	<b>2 *</b>
	Non-imminent	Subspecies/population	3
		Monotypic genus	4
		Species	5
Moderate to Low	Imminent	Subspecies/population	6
		Monotypic genus	7
		Species	8
	Non-imminent	Subspecies/population	9
		Monotypic genus	10
		Species	11
		Subspecies/population	12

#### Rationale for listing priority number:

##### *Magnitude:*

This species is highly threatened throughout its limited range by habitat loss and modification and by predation from nonnative predatory snails and rats. The small number of individuals and the small number of populations also make this species very susceptible to the negative effects of stochastic events such as hurricanes and storms. These threats occur range-wide. There are no efforts being made to control or eradicate rats and nonnative snails that pose a threat to the Tutuila tree snail or to stop the loss of habitat.

##### *Imminence:*

Threats to the Tutuila tree snails from habitat loss and predation by rats and the rosy carnivore snail are on-going and thus considered to be imminent.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? yes

Is Emergency Listing Warranted? No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *Eua zebrina* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

#### DESCRIPTION OF MONITORING

We conducted literature searches for recent articles on this species and contacted relevant species experts, University of Guam and University of Hawaii researchers regarding the current status of this species. No additional information on the species' status was found. However, the existing data regarding the species' status was verified.

This level of monitoring is appropriate to update the status of the species because a thorough literature search was conducted as well as relevant species experts contacted. Information contained in this assessment form was verified and any updated information incorporated. This species is listed as endangered in the International Union for Conservation of Nature and Natural Resources Red Data List database (International Union for Conservation of Nature and Natural Resources database 2004).

#### List of Experts Contacted:

Name	Date	Place of Employment
Barry Smith	July 11, 2005	University of Guam
Robert Cowie	July 11, 2005	University of Hawaii
Fred Amidon	July 11, 2005	U.S. Fish and Wildlife Service
Holly Freifeld	July 11, 2005	U.S. Fish and Wildlife Service
Ray Tulafono	Sept. 26 2005	American Samoa Dept. of Marine & Wildlife Resources

#### List of Databases Searched:

Name	Date
International Union for Conservation of Nature and Natural Resources	2004

#### COORDINATION WITH STATES

We contacted American Samoa Department of Marine and Wildlife Resources by email with a request for any information on the species and sent copies of our candidate forms. No response was received.

## LITERATURE CITED

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: **Acting** David W. Winkler  
Regional Director, Fish and Wildlife Service

11/11/05  
Date

Manuel P. J. Jr.

Concur: \_\_\_\_\_  
Director, Fish and Wildlife Service

August 23, 2006  
Date

Do not concur: \_\_\_\_\_  
Director, Fish and Wildlife Service

\_\_\_\_\_  
Date

Date of annual review: 9/27/05

Conducted by: Lorena Wada, Pacific Islands FWO

Comments:

PIFWO Review

Reviewed by: Gina Shultz  
Assistant Field Supervisor, Endangered Species

Date: 10/12/05

Patrick Leonard  
Field Supervisor

Date: 10/11/05